universities of Scotland, gives information concerning the allocation of grants during that period. The publication of this interim report, dealing only with nine months, was necessitated by an alteration of the financial year of the trust to bring it into line with the academic year of the universities. Sums amounting to 22,000*l*. have been handed over to the four Scottish universities during the nine months, bringing the total expenditure in this direction, since the inauguration of the first quinquennial scheme of grants in January, 1903, to 156,489*l*. The conditions which will regulate the second quinquennial distribution are under the consideration of a special sub-committee, and will, it is hoped, be published shortly. The total expenditure for 1906–7 under the scheme of endowment of post-graduate study and research was 7004*l*., and the estimated expenditure for the current academic year is 7615*l*. The expenditure upon fees for the summer session, 1907, amounted to 11,685*l*. The proposed scheme of inclusive fees, that is, that in each faculty a beneficiary of the trust should be granted all such instruction as it is desirable for him to receive in his course for a degree on the payment of one fee for each academic year, is still under discussion. Numerous appendices to the report provide detailed information as to the different items of expenditure.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 12, 1907.—"Further Consideration of the Stability of the Pear-shaped Figure of a Rotating Mass of Liquid." By Sir G. H. **Darwin**, K.C.B., F.R.S.

In vol. xvii., No. 3 (1905), of the Memoirs of the Imperial Academy of St. Petersburg, M. Liapounoff has published an abstract of his work on figures of equilibrium of rotating liquid. In this paper he explains how he has obtained a rigorous solution for the figure and stability of the pear-shaped figure, and he pronounces it to be unstable. In a paper in the Philosophical Transactions (vol. cc., A, pp. 251–314) the present author arrived at an opposite conclusion.

The stability or instability depends on whether the sign of a certain function is negative or positive.

M. Liapounoff attributes the disagreement to the fact that the author only computed a portion of an infinite series, and only used approximate forms for the elliptic integrals involved in the several terms. He believes that the inclusion of the neglected residue of the infinite series would lead to an opposite conclusion.

In the author's computation the critical function is decisively negative, whilst M. Liapounoff is equally clear that it is positive. The inclusion of the neglected residue of the series, which forms part of the function, undoubtedly tends to make the whole function positive, but after making the revision it remained incredible, at least to the author, that the neglected residue should amount to the total needed to invert the sign.

The analysis of his former investigation was re-examined throughout, and the computations were repeated by improved methods. The same method was also applied to the investigation of Maclaurin's spheroid, where the solution could be verified by the known exact result.[1]

Dissent from so distinguished a mathematician as M. Liapounoff is not to be undertaken lightly, and therefore especial pains were taken to ensure correctness. The author states his conviction that the source of the disagreement is to be found in some matter of principle, and not in the neglected residue of this series.

Entomological Society, February 5.—Mr. C. O. Waterhouse, president, in the chair.—*Exhibits*.—Dr. T. A. **Chapman**: A collection of butterflies made last summer at Gavarnie, in the Pyrenees, including a number of specimens of *Erebia lefebvrei*, with *E. melas* from south-east Hungary, for comparison.—H. St. John **Donisthorpe**: Eleven species of ants taken in the hot-houses in Kew Gardens in December, 1907, and January, 1908, eight being new to the published Kew list, and six species not before recorded as introduced in Britain.—J. E. **Collin**: Microscopically mounted specimens of the gnat *Epidapus scabiei*, Hopk., a potato pest in the United States recently discovered in England attacking narcissus bulbs.—A. H. **Hamm**: Very young larvæ of *Bitaris muralis*, hatched in captivity, the natural place of deposit of these eggs being at the entrance to the burrow of the bee, *Anthophora pilipes*, in stone walls near Oxford.—Commander **Walker**: Two specimens of the rare *Pyralis lienigialis*, Zell, ♀, taken at light in his house at Summertown, August, 1906, and 1907.—R. E. **Turner**: A box of Thynnidæ from South America, mostly from Chile, with several new species from Mendoza and the Peruvian Andes.—Prof. T. Hudson **Beare**: A specimen of *Trachyphlaeus scabriculus* taken at St. Margaret's Bay in August, 1907, with the two deciduous mandibles still in place.—Lieut.-Colonel **Manders**: The ♀ of *Papilio phorbanta* from Bourbon, an aberrant member of the Nireus group of Papilios, compared with the other members of the same group from the African mainland, Madagascar, and Mauritius. It was pointed out that whereas in all the other species the ♀♀s were some shade of green similar to the ♂♂s, the Bourbon insect was more or less uniformly brown. It was suggested that this was due to mimicry, *Euplaea goudoti*, a species strictly confined to Bourbon, being the model.—Hon. Walter **Rothschild**: Interesting papilionids; (1) *Troides alexandrae*, Rothsch., remarkable for the beauty of the ♂ and the gigantic size of the ♀, a new discovery by A. S. Meek, who found this fine insect in the north-eastern portion of British New Guinea at some distance inland from the coast; (2) a gynandromorphic specimen of Troides, the only one known of this genus, obtained by Dr. L. Martin in South Celebes. It belongs to *T. haliphron*, the left side being ♀ and the right side ♂.—R. **Adkin**: Bred specimens of *Tortrix pronubana*, Hb., to demonstrate that the species is continuously brooded.—L. W. **Newman**: Long series of *Melitaea aurinia* and *Notodonta chaonia* from various localities in the United Kingdom to illustrate the wide superficial variation of the respective species.—Dr. F. A. **Dixey**: Specimens of *Nychitona medusa*, Cram., and *Pseudopontia paradoxa*, Feld.—*Papers*.—(1) Two diplopterous Hymenoptera from Queensland; (2) notes on Thynnidæ, with remarks on some aberrant genera of the Scotiidæ: R. E. **Turner**.—Diaposematism, with reference to some limitations of the Müllerian hypothesis of mimicry: G. A. K. **Marshall**.

Zoological Society, February 18.—Dr. Henry Woodward, F.R.S., vice-president, in the chair.—A series of specimens of internal parasites obtained from animals recently living in the society's gardens: Dr. L. W. **Sambon**. Stress was laid on the important additions to knowledge to be derived from an adequate investigation of such material, and on the practical results to the health of the animals in the gardens that might be expected.—The inheritance of colour in domestic pigeons, with special reference to reversion: R. **Staples-Browne**. A series of skins was exhibited illustrating some experiments upon which the communication was based. Crosses had been made between black barbs and white fantails. The F1 generation was black with some white feathers. In the F2 generation, among other forms, blacks and whites were obtained, and also some blues. Blues were found to be dominant to whites, but blacks were dominant, or rather "epistatic," to the blues, which accounts for the fact that the reversionary form does not appear until the F2 generation. When two blues of the F2 or later generations were mated together blacks were never obtained again. A white in F2 mated to a fantail gave whites only. A second series of skins illustrated a cross between a white tumbler and a white fantail. Some white birds splashed with red had figured in the ancestry of the tumbler, although the bird itself showed no trace of colour. In the F1 generation such splashed kinds occurred, which, when mated together, gave in F2 birds which were red and white with some distinct blue feathers. Possibly the white tumbler was a dominant white.—Mammals collected by Mr. M. P. Anderson during a trip to the Mongolian Plateau, N.W. of Kalgan: O. **Thomas**. Nine species were mentioned, of which two were described as new. The paper formed the eighth of the series on the results obtained by the Duke of Bedford's zoological exploration in eastern Asia. No properly collected material from the Mongolian plateau had been previously available to students, and these specimens, representatives of its comparatively poor fauna, were therefore of much interest.—Butterflies of the division Rhopalocera from Africa and from New Guinea: G. T. **Bethune-Baker.**

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[1] Amer. Math. Soc. Trans., 1903, vol. iv., p. 113, on "The Approximate Determination of the Form of Maclaurin's Spheroid," and a further note on the same subject, recently sent to the same society.

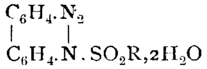
Chemical Society, February 20.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—Organic derivatives of silicon, part vi., the optically active sulphobenzylethylpropylsilicyl oxides: F. S. **Kipping.** The sulphonic acids obtained by resolving *dl*-sulphobenzylethylpropylsilicyl oxide have been further studied, and the two acids are shown to be optically active, enantiomorphously related compounds having the constitution

$$(SO_3H.CH_2.C_6H_4.SiEtPr)_2O.$$

—The preparation of conductivity water: H. **Hartley,** N. P. **Campbell,** and R. H. **Poole.** A still has been constructed which in one operation gives a fair yield of water with a conductivity 0·75 gemmho at 18°, starting from ordinary distilled water with a conductivity of 5 gemmhos.—Derivatives of *para*-diazoiminobenzene: G. T. **Morgan** and Miss F. M. G. **Micklethwait.**—The affinity constants of bases as determined by the aid of methyl-orange: V. H. **Veley.** Results were given for the hydrochlorides of (1) bases not containing an alkyl grouping; (2) aliphatic amines; (3) amino-acetic acids; and (4) uric acid derivatives.—The action of thionyl chloride and of phosphorus pentachloride on the methylene ethers of catechol derivatives: G. **Barger.**—A study of the diazo-reaction in the diphenyl series: G. T. **Morgan** and Miss F. M. G. **Micklethwait.** The arylsulphonylbenzidines, $RSO_2.N\overset{*}{H}.C_6H_4.C_6H_4.NH_2$, furnish yellow crystalline diazonium salts giving rise on treatment with aqueous sodium acetate to dark brown crystalline compounds, which are either monohydrated nitrosoamines,

$$R.SO_2.NH.C_6H_4.C_6H_4.NH.NO,H_2O,$$

or dihydrated diazoimides,

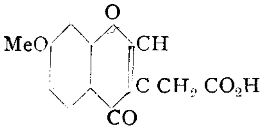


$$\begin{array}{l} C_6H_4.N_2 \\ | \qquad\; | \\ C_6H_4.N.SO_2R,2H_2O \end{array}$$

The diazonium salts of the arylsulphonylalkylbenzidines,

$$RSO_2.N(C_2H_5).C_6H_4.C_6H_4.NH_2,$$

although distinctly less coloured than those of the unalkylated bases, have nevertheless not been obtained in a colourless condition. There is accordingly no reason for supposing that the diazonium salts of the alkylated bases are differently constituted from those which still contain the labile acidic hydrogen atom (*).—A simple manometer for vacuum distillation: N. L. **Gebhard.**—Researches on the anthraquinones: W. H. **Bentley** and C. **Weizmann.** The condensation products of phthalic and hemipinic anhydrides with veratrole and pyrogallol trimethyl ether are described.—The formation of 4-pyrone compounds from acetylenic acids, part i.: S. **Ruhemann.**—The action of mustard oils on the ethyl esters of malonic and cyanoacetic acids: S. **Ruhemann.**—The triazo-group, part ii., azoimides of propionic ester and of methyl ethyl ketone: M. O. **Forster** and H. E. **Fierz.** On comparing the behaviour of the α- and β-triazo-derivatives of ethyl propionate towards alkali, it was found that, whilst the first-named resembles triazoacetic ester, ethyl β-triazopropionate rapidly parts with hydrazoic acid.—Brazilin and hæmatoxylin, part viii., synthesis of brazilinic acid, the lactones of dihydrobrazilinic and dihydrohæmatoxylinic acids, anhydrobrazilic acid, &c. The constitution of brazilin, hæmatoxylin, and their derivatives: W. H. **Perkin,** jun., and R. **Robinson.** Further confirmation of the constitution (Proc., 1907, xxiii., 291) of the members of this group is afforded by the synthesis of anhydrobrazilic acid, which has been proved to possess the formula



Edinburgh.

Royal Society, February 17.—Dr. John Horne, F.R.S., vice-president, in the chair.—The systematic motion of the stars: Prof. **Dyson.** A careful study of 1500 stars having large proper motions corroborated Kapteyn's hypothesis that the stars moved in two well-defined streams crossing each other in space.—Preliminary note on *Lepidophloios Scotti*, a new species from the Calciferous Sandstone series at Pettycur, Burntisland: W. T. **Gordon.** Some of the diagnostic features of this new species named after Dr. D. H. Scott are:—(1) the short straight ligular canal the opening of which is protected by the overlying leaf base, and which opens far back from the leaf scar; (2) a marked concavity of the leaf base from half-way between the opening of the ligular canal and the leaf scar to the leaf scar itself; (3) the comparatively long course of the parichnos before it forks.—The middle cells of the grey matter of the spinal cord: Dr. J. H. Harvey **Pirie.** The description of the anatomical arrangement of these small cells showed that Argutinski was wrong in ascribing a segmented character to the group, and that the cells extended throughout the whole length of the cord, being specially numerous in the two enlargements.—*q*-Functions and a certain difference operator: Rev. F. H. **Jackson.**

Paris.

Academy of Sciences, February 24.—M. H. Becquerel in the chair.—M. B. Baillaud was elected a member of the section of astronomy in the place of the late M. Lœwy.—Results of the measurements of the diameters of Mercury during its transit of November 14, 1907: Robert **Jonckheere.** The mean diameter is 9″·10, higher than the figure usually accepted, 8″·68. A table of results is given.—Observations of the sun made at the Observatory of Lyons during the fourth quarter of 1907: J. **Guillaume.** The results are summarised in three tables showing the number of spots, the distribution of the spots in latitude, and the distribution of the faculæ in latitude.—Researches on the dispersion of light in celestial space: Charles **Nordmann.** From measurements on two fixed stars by the photometric method previously described by the author, the conclusion is drawn that light undergoes a dispersion in space. These results can be applied to give new indications of the parallax of variable stars.—The congruences of plane curves: C. **Popovici.**—Remarks on a communication of M. E. E. Levi: E. **Holmgren.** A question of priority.—The singularities of differential equations of the first order: Georges **Rémoundos.**—Images the appearance of which changes with a projection screen ruled as a grating: E. **Estanave.**—The influence of sunlight on the disengagement and on the orientation of the gaseous molecules in solution in sea-water: Raphael **Dubois.** If test-tubes containing various coloured solutions are plunged into sea-water and the whole exposed to the sun, it is noticed that bubbles of gas are deposited on the outside wall of the tube. If the solution in the tube is green, the evolution of gas, which is rich in oxygen, is much greater than with the other colours. That this is not due to the selective absorption of calorific radiations was shown by substituting water charged with carbon dioxide for the aërated sea-water; the increased effect with the green tube was not observed.—The curves of induced radio-activity obtained by MM. Sarasin and Tommasina: J. **Danne.** An explanation of the results of these authors, by considering the distribution of the field in the different parts of the measuring apparatus.—The method of working of the electrolytic detector: the influence of temperature: Henri **Abraham.** The change in capacity and resistance of the electrolytic detector caused by raising the temperature to 120° C. gives several advantages in practical working.—The atomic weights of nitrogen, oxygen, and carbon: A. **Leduc.** The International Committee on Atomic Weights has now lowered the atomic weight of nitrogen from 14·044 to 14·01. Using this figure and the ratio of the densities of carbon monoxide and nitrogen, as determined experimentally by Lord Rayleigh and by the author, it is shown that the atomic weight of carbon must lie between 12·011 and 12·016.—Phosphorus oxybromide: E. **Berger.** Phosphorus pentabromide heated with phosphorus pentoxide gives a good yield (85 per cent.) of phosphoryl bromide.—This forms crystals, melting at 56° C. and boiling at 189°·5 C. under 774 mm. Its vapour density is normal. The heat of formation has also been determined.—The essentially chemical causes of the allotropic transformation of white phosphorus dissolved in essence of turpentine: Albert **Colson.**—An isomeric modification of hydrated hypovanadic acid: Gustave **Gain.** The acid $V_2O_4,2H_2O$ exists in two forms, one green and the other rose colour. The change from one of these isomers to the other is accompanied by a thermal change, and this has been measured in the calorimeter.—Lutecium and neoytterbium: G. **Urbain.** The fact that Marignac's ytterbium can be separated into two elements differing in atomic weight by more than three units was briefly described by the author three months ago. The present communication contains fuller details of the methods and results. These results have been confirmed by Auer von Welsbach, who has described the two elements thus separated under the names of aldebaranium and cassiopeium. The former of these is identical with lutecium, and the latter with neoytterbium.—The action of sulphosalicylic acid upon borax: L. **Barthe.**—The action of nascent hypoiodous acid (iodine and sodium carbonate) upon some acids of the general formula

$$R—CH=CH—CH_2—CO_2H,$$

R being the phenyl group more or less substituted: J. **Bougault.** The product of this action is an acid of the general formula $R—CO—CH=CH—CO_2H$.—Antiamylasic serum: C. **Gessard** and J. **Wolff.** Quantitative studies on an enzyme preventing the action of malt extract upon starch.—The action of amylase of the pancreatic juice and its stimulation by the gastric juice: H. **Bierry.**—Note on the existence of products of cellular degenerescence recalling Negri's bodies: Y. **Manouélian.**—The measurement of the ventricular wave in man: Gabriel **Arthaud.**—The fixation, multiplication, and mode of attack of pathegenic trypanosomes in the proboscis of the tsetse-fly: E. **Roubaud.**—The genus Doliocystis: L. **Brasil.**—Stratigraphical researches in eastern Morocco: Louis **Gentil.**—Primary strata of Morvan and the Loire: Albert **Michel-Lévy.**—The extension of the Oligocene depressions in a part of the central *massif*, and their *rôle* from the hydrological point of view: Ph. **Glangeaud.**—New researches on the rare gases of thermal springs. Yields of gas in certain cases: Charles **Moureu** and Robert **Biquard.** The gases from nine springs have been examined. The proportions of the rare gases, taken together, vary from 1·24 per cent. to 6·39 per cent., the helium from 0·097 per cent. to 5·34 per cent. The total quantity of helium thus obtainable is very large, a spring at Bourbon-Nancy giving 10,000 litres per annum. The helium was separated by means of charcoal at the temperature of liquid air boiling under reduced pressure, and contained only a trace of neon as impurity.

DIARY OF SOCIETIES.

THURSDAY, March 5.

Royal Society, at 4.30.—On the Atomic Weight of Radium: Dr. T. E. Thorpe, C.B., F.R.S.—On the Electrical Resistance of Moving Matter: Prof. F. T. Trouton, F.R.S., and A. O. Rankine.—On the Nature of the Streamers in the Electric Spark: Dr S. R. Milner.—The Relation between Wind Velocity at 1000 Metres Altitude and the Surface Pressure Distribution: E. Gold.

Royal Institution, at 3.—Early British History and Epigraphy: Sir John Rhys.

Chemical Society, at 8.30.—The Solubility of Iodine in Water: H. Hartley and N. P. Campbell.—Traces of a New Tin-group Element in Thorianite: Miss C. de B. Evans.

Institution of Electrical Engineers, at 8.—Fuse Phenomena: Prof. A. Schwartz and W. H. N. James.

Linnean Society, at 8.—On the Morphology of Stigmaria in Comparison with Recent Lycopodiaceæ: Prof. F. E. Weiss.—On *Trichoniscoides albidus* and *T. sarsi*: Alexander Patience.—*Exhibits*: Fruit Destroying Flies: W. W. Froggatt.—Mimicry in the Common Sole: Dr. A. T. Masterman.

FRIDAY, March 6.

Royal Institution, at 9.—The Figure and Constitution of the Earth: Prof. Love.

Institution of Civil Engineers, at 8.—Surveying on Thunder Bay Branch of the Grand Trunk Pacific Railway, Canada: R. V. Morris.—British Practice in Railway Surveying W. Graham.—Railway Surveying in Great Britain: W. C. Crawford.

Geologists' Association, at 8.—The After-history of the West Indian Eruptions of 1902: Dr. Tempest Anderson.

SATURDAY March 7.

Royal Institution, at 3.—Electric Discharges through Gases: Prof. J. J. Thomson, F.R.S.

MONDAY, March 9

Royal Society of Arts, at 8.—Fuel and its Future: Prof. Vivian B. Lewes.

Royal Geographical Society, at 8.30.—Exploration in Southern Nigeria: Lieut. E. A. Steel.

TUESDAY, March 10.

Royal Institution, at 3.—Membranes: Their Structure, Uses and Products: Prof. W. Stirling.

Royal Anthropological Institute, at 8.15.—The Origin of the Crescent as a Muhammadan Badge: Prof. W. Ridgeway.—Some Prehistoric Antiquities in Central France: A. L. Lewis.

Institution of Civil Engineers, at 8.—*Further discussion*: The New York Rapid-transit Subway: W. B. Parsons.

WEDNESDAY, March 11.

Royal Society of Arts, at 8.—The Use of Reinforced Concrete in Engineering and Architectural Construction in America: Ernest R. Matthews.

Royal Meteorological Society, at 7.30.—Lecture on the Dawn of Meteorology: Dr. G. Hellmánn.

THURSDAY, March 12.

Royal Society, at 4.30.—*Probable Papers*:—Description of the Brain of Mr. Charles Babbage, F.R S.: Sir Victor Horsley, F.R.S.—The Origin and Destiny of Cholesterol in the Animal Organism. Part II., The Excretion of Cholesterol by the Dog: C. Dorée and J. A. Gardner.—On Reciprocal Innervation in Vasomotor Reflexes and the Action of Strychnine and of Chloroform thereon: Dr. W. M. Bayliss, F.R.S—Bacteria as Agents in the Oxidation of Amorphous Carbon: Prof. M. C. Potter.

Royal Institution, at 3.—Early British History and Epigraphy: Sir John Rhys.

Royal Society of Arts, at 4.30.—Progress in the Native States of India during the past Forty Years: Sir David W. K. Barr, K.C.S.I.

Mathematical Society, at 5.30.—On the Projective Geometry of some Covariants of a Binary Quintic: Prof. E. B. Elliott.—On the Inequalities connecting the Double and Repeated Upper and Lower Integrals of a Function of Two Variables: Dr. W. H. Young—On the Operational Expression of Taylor's Theorem: W. F. Sheppard.—A Proof of a Theorem of Fermat's: Dr. H. A. P. de S. Pittard.

Institution of Electrical Engineers, at 8.—America Re-visited, 1907: Sir W. H. Preece, K.C.B., F.R.S.

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